

REMARKS

Claims 1, 5, 7, 10 to 20, 22 to 32, 37, 39 and 40 are pending, of which claims 1, 26, 30, and 37 are independent.¹ Favorable reconsideration and further examination are respectfully requested.

In the Office Action, claims 1, 5, 7, 10 to 20, 30 to 32, 37, 39 and 40 were rejected over JP5-089899 in view of U.S. Patent No. 6,544,676 (Lim). The remaining claims were rejected over JP5-089899 and Lim in view of previously-applied U.S. Patent No. 4,775,439 (Trocciola).

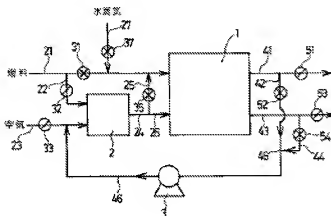
Independent claim 1 recites:

1. A fuel cell system comprising:
 - a fuel cell comprising an anode, a cathode, and an ion exchange membrane between the anode and the cathode;
 - a fuel delivery conduit comprising:
 - a fluid flow field plate forming part of the anode, having a fluid flow channel extending through the fluid flow plate;
 - a fuel delivery inlet coupled to one end of the fluid flow channel;
 - a fuel delivery outlet coupled another end of the fluid flow channel; and
 - a fluid flow regulator for controllably varying a quantity of fuel delivered to a mixing point adjacent to the fuel delivery inlet; and
 - a recirculation conduit for the anode, the recirculation conduit extending between the fuel delivery outlet and the fuel delivery inlet via the mixing point, wherein the mixing point is external to the fuel cell and comprises either (i) a reaction chamber for reacting fuel, or (ii) a pre-mixing chamber, the mixing point for mixing fuel from the fluid flow regulator with oxidant species from the recirculation conduit.

The applied art is not understood to disclose or to suggest at least the underlined portions of claim 1 above. More specifically, independent claim 1 recites that the fluid flow plate forms part of the anode, that the fluid flow plate has a fluid flow channel, and that the fluid delivery inlet is coupled to an end of the fluid flow channel. Thus, according to the claim, the fluid delivery inlet is coupled to the anode. The recirculation conduit therefore extends between the fuel delivery outlet and the fuel delivery inlet (which is coupled to the anode) via the mixing point.

¹ The Examiner is urged to independently confirm this recitation of the pending claims.

By contrast, JP5-089899 does not describe a recirculation conduit for the anode, that extends between a the fuel delivery outlet and a fuel delivery inlet coupled to the anode. Rather, referring to Fig. 1 of JP5-089899 below, pipeline 46 extends between outputs of fuel cell 1 and the fuel cell's cathode via catalytic combustion device 2. This is described in the English-language translation of JP5-089899.



More specifically, as described in paragraphs 0017 to 0019 of the translation, prior to normal operation, and in order to pre-heat the fuel cell, valve 31 is closed so that no fuel reaches the anode (top arrow of the fuel cell). Fuel is fed from piping 21 to catalytic combustion device 2, together with oxidant from piping 23. A combustion product from catalytic combustion device 2 is fed to cathode inlet 26 to pre-heat the cathode. Valve 35 is first closed to prevent oxidant from reaching the anode. Thereafter, valve 35 is opened to allow hot combustion product to pre-heat the anode. Upon operation of the fuel cell, valve 31 is opened and the operation of catalytic combustion device 2 is suspended. Thereafter, discharge from the anode and cathode is provided, via piping 46, to mix with air in piping 23 for delivery to the cathode.

Accordingly, JP5-089899 describes recirculation in a cathode path, and not for an anode, as claimed. Lim and Trocciola are not understood to remedy the foregoing deficiencies of JP5-089899 vis-à-vis claim 1. Accordingly, claim 1 is believed to be patentable over this art.

Independent claim 26 also includes a recirculation conduit for the anode, which recirculation conduit extends between the fuel delivery outlet and the fuel delivery inlet via a mixing point adjacent to the fuel delivery inlet. Accordingly, claim 26 is also believed to be patentable for at least the same reasons explained above.

Independent claim 30 recites the following features:

wherein the reaction chamber is external to the fuel cell and is adapted so that at least a part of the fuel supply delivered to the reaction chamber is reacted with the oxidant supplied to the reaction chamber to precondition fuel being delivered to the anode;

wherein the fuel delivery conduit further comprises a recirculation conduit to supply oxidant from an output of the fuel cell to the reaction chamber.

Thus, claim 30 recites that the reaction chamber preconditions fuel being delivered to the anode, and that a recirculation conduit supplies oxidant from the output to the reaction chamber. As explained above, referring to Fig. 1 of JP5-089899 above, pipeline 46 extends between outputs of fuel cell 1 and the fuel cell's cathode via catalytic combustion device 2. Accordingly, JP5-089899 does not describe a recirculation conduit that supplies oxidant from the output of the fuel cell to a reaction chamber that preconditions fuel being delivered to the anode. The remaining applied references are not understood to remedy this deficiency of JP5-089899. Accordingly, claim 30 is believed to be patentable over the applied art.

Independent claim 37 recites:

recirculating fluid within the fluid delivery conduit to a mixing point upstream of the active surface area of the anode;

effecting a controlled combustion of fuel and oxidant species at the mixing point and external to the fuel cell, at least some of the recirculated fluid being part of the controlled combustion; and providing a resulting output of the controlled combustion to the active surface of the anode.

As explained above, these features are not disclosed or suggested by the applied art.

Accordingly, claim 37 is also believed to be patentable over this art.

Dependent claims are also believed to define patentable features. Each dependent claim partakes of the novelty of its corresponding independent claim and, as such, each has not been discussed specifically herein.

It is believed that all of the pending claims have been addressed. However, the absence of a reply to a specific rejection, issue or comment does not signify agreement with or concession of that rejection, issue or comment. In addition, because the arguments made above may not be exhaustive, there may be reasons for patentability of any or all pending claims (or other claims) that have not been expressed. Finally, nothing in this paper should be construed as an intent to concede any issue with regard to any claim, except as specifically stated in this paper, and the amendment of any claim does not necessarily signify concession of unpatentability of the claim prior to its amendment.

In view of the foregoing amendments and remarks, we respectfully submit that the application is in condition for allowance, and such action is respectfully requested at the Examiner's earliest convenience.

The undersigned attorney can be reached at the address shown below. All telephone calls should be directed to the undersigned at 617-521-7896.

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Respectfully submitted,

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